Things that Make Sense

Diesel versus LPG

The Need for Reliable Energy for Both on and off Grid Applications

Power applications (especially those used within the telecom industry) with on-site generators need a reliable power source, since a loss in power can result in significant economic consequences as well as catastrophic humanitarian crises and loss of life. Typically, these generator systems use batteries to provide instant grid back-up power and generators for longer duration back-up power. Critical applications have redundancy throughout their systems except for the weakest point of the system, which is the diesel fuel supply, which powers the generators. Using LPG or natural gas to back up the fuel supply is a sensible and pragmatic solution.

In today's world of data services, computer apps, emergency services, and telecommunications, the availability of an uninterrupted supply of electric power is critical. Maximum uptime achieved through consistent power drives both revenues and customer satisfaction, while smoothly-operating equipment with low maintenance requirements can allow management and field technicians to focus their time and resources elsewhere.

Achieving this level of reliability requires careful consideration of fuel sources and generator systems. LPG and natural gas are more reliable fuels than diesel, yet diesel today remains the more popular fuel source. ***This article considers the benefits of multifuel at sites for increased reliability; such benefits are obvious especially during storms or fuel shortages. If only one fuel is desired, then LPG and natural gas are recommended over diesel. Consider this…***

After Hurricane Katrina crippled communications in Louisiana and surrounding states in 2005, a study was commissioned to report on the failures in the communications infrastructure. For the convenience the report can be found using this link: https://polarpower.com/file/KatrinaNSFreport.pdf.

To sum up the report's findings:

1. Generators and their diesel fuel tanks were flooded. Roof top generators fueled with natural gas continued to supply electric power.
2. Rental / Mobile generators after 3 days of running failed as they were unable to get refueled due to scarcity of diesel fuel due to difficult road conditions and high demand for the fuel.
3. To maximize access to energy a strong recommendation was made for each site to have the ability to use multiple fuels. Also, installations should have permanent solar power installed to reduce refueling.

LPG and natural gas offer a compelling alternative to traditional diesel-powered generators, especially in remote or off-grid environments.

Skeptical about LPG? Consider this:

- **Dual-Fuel Solutions**: For those hesitant to rely solely on LPG, a dual-fuel approach combining LPG and diesel provides reliability through redundancy, flexibility, and lower fuel cost.
- **Diesel's Decline in Reliability**: While diesel once epitomized durability and reliability, today's stringent emissions regulations have made diesel engines complex and highly dependent on fuel quality. The days when old fashion diesel engines could run on crude oil straight off the well head by simply filtering out the sand and rocks are long gone.

The Challenges of Diesel in Backup Generators
If you associate the reliability of diesel fuel with the operation of a diesel vehicle, bear in mind there is a huge difference with the operation of a stationary diesel generator.

Consider the following conditions that presents unique challenges for diesel generators verses trucks:

- **Fuel Degradation (spoilage) Over Time**: Backup generators store diesel for extended periods, with minor top-offs during maintenance. This standing fuel is prone to spoilage due to contamination over time.
- **Open-Air Ventilation**: Unlike sealed truck fuel tanks with small filtered vents, the required UL-142 stationary generator tanks have large vents to the open air, increasing contamination from bacteria, mold, and water intrusion.
- **Lower Quality Fuel Delivery**: Trucks typically refuel at high-turnover stations, ensuring fresher fuel, while remote sites depend on vendors who may prioritize cost over quality and source the fuel wherever they can get it.
- **Maintenance Gaps**: Trucks receive routine maintenance at dedicated facilities, whereas remote generators often rely on field mechanics with limited tools and challenging conditions (rain, wind, snow, heat, cold, sand/dirt, poor lighting, and travel exhaustion).
- **Complex Emission Systems**: Many diesel generators require additional maintenance for components such as diesel particulate filters (DPFs) to meet emission standards. While these tasks are manageable for trucks that can access service facilities, they are far more difficult to maintain on remote locations.

Common Diesel Generator Failures
Diesel-powered systems are plagued by predictable failure points:

1. **Starting Battery Issues**: It takes more energy to start a diesel then a natural gas or LPG generator, therefore the starting battery must be kept in good condition. Polar Power addresses this critical need by using supercapacitors, eliminating lead-acid battery problems (cold and hot weather, theft).
2. **Fuel Shortages**: Poor monitoring of fuel availability on site and delivery failures lead to power outages. Trying to start a diesel generator without fuel can damage the engine.
3. **Incorrect Diesel Fuel Type**: Not using the correct winter blends in cold weather will cause the fuel to gel preventing the generator from starting. Biodiesel can cause corrosion affecting the fuel tanks, level gauges, fuel pumps, and injectors.
4. **Fuel Theft and Contamination**: Dilution of the fuel with water, paraffin / kerosene, or other liquids is used to steal fuel causing:
    - Clogged injectors and fuel lines
    - Corrosion of fuel systems
    - Accelerated injector wear and engine failure
5. **Complete Fuel Theft**: Draining the entire tank of fuel.
6. **Neglected Maintenance**: Improper servicing of belts, pumps, fluids, and filters.

The unscheduled maintenance is the most expensive when generator fails during the night, weekend, or holiday. The maintenance and fuel cost savings along with increased site revenues for uptime should justify the cost of a second generator.

- Takes longer to travel at night and the repair is more difficult.
- Service crews have fewer technicians during the holidays, travel is slowed due crowded roads and airports, and it's harder to get generator parts with stores closed.
- Sites are down for a longer period as a result of unscheduled maintenance creating greater revenue losses.
- Maintenance companies may face monetary penalties for the site being out of commission.
- If there are 2 generators of the same fuel on site for critical loads, a fuel failure typically affects both generators.
- The solution is 2 different fuels on site, the concept is having a backup fuel. The prime fuel is the one with the lowest cost and the backup fuel provides the security.

The LPG Advantage During Disasters

Concerns about LPG availability during disasters are often unfounded, especially in contrast when diesel shortages have proven to be common. The availability of LPG and contingency plans for delivery during disasters should be negotiated with the supplier.

Historical events like Hurricane Katrina demonstrated this disparity:

- **Diesel Shortages**: During a disaster the first device to start are the diesel (and gasolene) generators and the second are trucks transporting people and supplies. Disasters typically trigger mass evacuations and an influx of emergency services, all competing for limited fuel at refueling stations. Additionally, a significant number of generators (80% or more) utilize diesel, further intensifying the strain on supply chains.
- **Flood Vulnerability**: Flooding poses a significant risk to diesel storage, as water intrusion will contaminate the fuel, rendering it unusable or causing extensive damage to generators. In contrast, LPG storage remains secure during floods due to its pressurized, sealed containers, which prevents contamination (just make sure the LPG tanks are securely fastened to the ground).
- **Reduced LPG Demand**: Diesel powers most of generators and sees significant spikes in usage during disasters. Freezing weather may also increase demand for LPG heating. Hurricanes and flooding lowers LPG demand because of evacuations. Uncertainty is a strong argument for multifuels on site.

For critical applications, especially in telecommunications - where power reliability directly impacts revenue and safety, a dual-fuel system hardens the site very effectively.

Beyond Disasters: Everyday Challenges
Even during normal operations, diesel generators face hurdles:

- **Grid Outages and Prime Power Sites**: In non-disaster scenarios, such as routine grid outages or operations at prime power sites without grid access, diesel is often cited as being more available and easier to deliver than LPG. However, this perspective frequently overlooks a critical factor: the requirement for a consistent supply of high-quality diesel. Ensuring the delivery of correct diesel blends, uncontaminated, not spoiled diesel fuel to sites remains a persistent challenge worldwide. This underscores the importance of comparing not just the availability but also the quality and dependability of diesel versus LPG supplies.
- **Mitigating Theft Risks**: Fuel theft is a pervasive issue for any site (especially remote), and diesel is particularly vulnerable due to its ease of access and high market demand. Diesel can be drained directly from tanks, often in large quantities, or diluted with cheaper substances like water or kerosene, causing equipment damage and operational failures. In contrast, LPG systems are inherently more secure; their pressurized storage design makes siphoning far more challenging, and the lower resale value of LPG reduces the incentive for theft. This added security makes LPG a more reliable and cost-effective choice for remote and unmanned power generation sites.

The Critical Weak Link

Telecom systems are built with redundancy: batteries back up the grid, and generators back up the batteries. Yet the Achilles' heel is often the diesel fuel supply itself. Backing up your fuel supply with LPG or solar ensures uninterrupted power, safeguarding revenues and potentially saving lives in emergency services.

The Logical Choice

Switching to LPG or hybrid solar LPG systems is not just an environmentally conscious decision: it's a strategic one. Whether mitigating disaster risks or navigating the everyday challenges of remote power generation, LPG offers superior reliability, efficiency, and peace of mind. Make the switch today and secure a brighter, more dependable energy future.